

What is claimed is:

1 1. An apparatus for metal electroplating,
2 comprising:

3 a electroplating tank for containing an electrolyte
4 at a first temperature;

5 a substrate holder for holding a semiconductor
6 substrate; and

7 a heater for heating the portion of the electrolyte
8 adjacent to the substrate holder to a second
9 temperature higher than the first temperature.

1 2. The apparatus as claimed in claim 1, wherein
2 the heater comprises an electrothermal coil.

1 3. The apparatus as claimed in claim 1, wherein
2 the heater comprises a heat-exchange pipe containing
3 thermal oil.

1 4. The apparatus as claimed in claim 1, wherein a
2 temperature difference of about 5 to 60 °C exists between
3 the second temperature and the first temperature.

1 5. The apparatus as claimed in claim 1, wherein
2 the second temperature is about 27 to 80 °C.

1 6. The apparatus as claimed in claim 1, wherein
2 the electrolyte comprises Cu ions.

1 7. The apparatus as claimed in claim 1, wherein
2 the heater is embedded in the substrate holder to
3 generate heat and conduct heat to the substrate and the
4 adjacent electrolyte thereof.

1 8. The apparatus as claimed in claim 1, wherein
2 the heater is independently disposed in the
3 electroplating tank and in a position opposite to the
4 substrate holder.

1 9. A method of metal electroplating, comprising
2 the steps of:

3 placing a semiconductor substrate into an
4 electroplating tank filled with an
5 electrolyte; and

6 heating the portion of the electrolyte adjacent to
7 the semiconductor substrate via an independent
8 heater during electroplating of the
9 semiconductor substrate.

1 10. The method as claimed in claim 9, wherein the
2 heater is independent to the electroplating tank and
3 disposed in a position opposing the semiconductor
4 substrate.

1 11. The method as claimed in claim 9, wherein the
2 semiconductor substrate is held by a substrate holder and
3 the heater is embedded therein.

1 13. The method as claimed in claim 9, wherein the
2 heater comprises a heat-exchange pipe containing thermal
3 oil.

1 15. A method of metal electroplating, comprising

2 the steps of:

3 providing an electroplating tank containing an

4 electrolyte at a first temperature, wherein the

5 electrolyte comprises metal ions;

6 immersing a semiconductor substrate held by a

7 substrate holder into the electrolyte;

8 heating the portion of the electrolyte adjacent to

9 the semiconductor substrate to a second

10 temperature by a heater independent of the

11 electroplating tank; and

12 electroplating the semiconductor substrate with the

13 portion of the electrolyte at the second

14 temperature to form a metal layer thereon.

1 16. The method as claimed in claim 15, wherein a

2 seed layer of the same type of metal ion as that in the

3 electrolyte is formed over the semiconductor substrate

4 prior to immersion of the semiconductor substrate.

1 17. The method as claimed in claim 15, wherein the
2 heater comprises an electrothermal coil.

1 18. The method as claimed in claim 15, wherein the
2 heater comprises a heat exchange pipe containing thermal
3 oil.

1 19. The method as claimed in claim 15, wherein the
2 heater is disposed in a position opposing the
3 semiconductor substrate in the electroplating tank.

1 20. The method as claimed in claim 15, wherein
2 heater is embedded in the substrate holder.

1 21. The method as claimed in claim 15, wherein a
2 temperature difference of 5 to 60 °C exists between the
3 second temperature and the first temperature.

1 22. The method as claimed in claim 15, wherein the
2 second temperature is about 27 to 80 °C.

1 23. The method as claimed in claim 15, wherein the
2 electrolyte comprises copper (Cu) ions.